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FOREST HEALTH PROTECTION
SOUTH SIERRA SHARED SERVICE AREA

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To: Michelle Donahue, Environmental Program Manager
Tuolumne Band of Me-Wuk Indians

From: State and Private Forestry, Forest Health Protection, South Sierra Shared Service Area

Subject: Recent Western Pine Beetle Activity, Tuolumne Band of Me-Wuk Indian Reservation

On March 3, 2015, Forest Health Protection (Beverly Bulaon and Martin MacKenzie) accompanied Jim Roehl, Bill Dutra, and William Dutra to assess several recently killed ponderosa pines on the Tuolumne Me-Wuk Reservation, Tuolumne, CA. Within the span of two months, Jim was notified of ponderosa pines suddenly fading around the area in large groups. Dead trees become an issue of public hazard and safety, but also concern that more trees have the potential to be lost by forest pests. This report document observation made during the field visit, and discusses possible management options.

Introduction

The Reservation is about an 800 acre square parcel that ranges between 1800-2500 feet in elevation, in the foothills of the Sierra Nevada. In an average wet year the rainfall for Tuolumne City is 33 inches, with the occasional snowfall. Forested areas are primarily canyon live oak-grey pine type, with ponderosa pines growing in the upper elevation and in wet drainages. Heavy brush cover a large percentage of ground, mainly buck brush and deer brush *Ceonothus*, manzanita, poison oak, or chamise. While tree stocking may not be dense, brush can be as high as 90% cover and sometimes as tall as five feet high. Where ponderosa pines are found, basal area component of pine is as little as 50 ft^2/acre but trees can be fairly large.

Bark beetle-killed ponderosa pine trees were found on properties next to Turnback Creek and Mi-Wu Street (see Figure 1). About 10 trees in the general vicinity were noted with recent crown fade, woodpecker flaking on the upper bole, and multiple pitch tubes on the trunk. One smaller dead pine was noted next to a log deck killed by woodborers rather than bark beetles. Half of the pines were of fairly large diameter (>25 inches diameter at breast height) and within falling zones of the road or houses. One large tree was noted with only top-kill, but assessed to be mass-attacked as well since the coloration of the remaining crown was not very green. No other tree species was noted as fading or declining in the area.

Figure 1. Recently dead and fading ponderosa pines along the Turnback Creek drainage.

Western pine beetle (*Dendroctonus brevicomis,* WPB) is a native bark beetle that feeds only ponderosa and coulter pines. Adults are about 3 to 5 millimeters in size (size of a rice grain), and typically a dark brown in color. Emergence of adults to seek new hosts can start in the spring as soon as temperatures stay consistently warm (> 60 degrees Fahrenheit) and keep flying until temperatures drop in the fall. While there may be peaks in the flights, emergence of beetles can be straggled throughout season. Once trees are selected and mass-attacked, adult pairs construct galleries underneath the bark for brood development. If conditions are favorable, this next generation can develop quickly and emerge after a few months to infest new trees. Identification of infestation is by small reddish-brown pitch tubes scattered along the mid-bole, boring dust found in bark crevices, or woodpeckers flecking the outer bark looking for WPB larvae.

Western Pine beetle is primarily responsible for ponderosa pine mortality but does have associates that help overcome tree defenses. With water conditions so severe in the state, WPB has an abundance of drought-stressed trees susceptible for infestation. Weakened trees are unable to produce enough defensive resin to "pitch out" attacking beetles. Stand conditions that are overcrowded, stagnant, diseased, or recently injured (ex: wildfire) are also attractive to bark beetles. WPB typically favor larger trees for better brood development and protection, but will attack smaller diameters if populations are high. Red turpentine beetles (*Dendroctonus valens*) and woodborers may attack the lower bole where bark is thickest either before, after, or in concurrence with WPB attacks. WPB prefer mid-sections of the bole, leaving the smaller diameter terminals (<6 inches smaller) to pine engravers or woodborers. The combination of multiple attacking pests and drought-stress have resulted in rapid tree decline.

Discussion and Management Options

While the outlook for more rainfall is bleak for the State this remaining spring, there are treatment options available for providing short-term protection, but long-term prevention strategies should be considered to further prevent undesirable mortality. It is expected that bark beetle mortality will continue this year, intensifying from the year before. Until sufficient precipitation occurs for a consecutive number of years to replenish underground water stores and revive stressed trees, bark beetles will continue to attack and distribute where hosts are found.

There are more options available for homeowners than agencies that often have to treat at larger scales than single trees. While some treatments are more effective than others, there are no guarantees that treatments will completely deter invading beetles but rather mitigate potential hazards or mortality.

- ***Short-term:***
  - Preventative chemicals for *uninfested* trees will stop attacking beetles but must be done **before** beetle flight. Recommended for high-value trees only.
    - There are soil injection formulas and topical spray formulations. Please contact a certified pest control specialist for details of costs and products.
  - Removal of *currently-infested* trees will reduce potential hazards but strongly encouraged to combine removals with density reduction thinning
  - Deep watering water-stressed trees will provide some respite. If trees are receiving adequate irrigation, risk is low from neighboring infestations.
  - Prevent mechanical injury during construction, ground disturbance, or soil compaction around high-value trees
  - Lop and scatter treatments are suggested over chipping this spring

- ***Long-term:***
  - Thinning in dense stands (55-75% basal area of optimal stocking) to reduce resource competition between trees. Focus should be in mature pine plantations or areas with high composition of pines. Maintaining proper stocking for site will greatly enhance individual tree vigor and health.
  - Reduction of smaller diameter understory and brush to redistribute limited resources
  - Promotion of diversity in age, structure, or tree species
  - Proper treatment of green slash or currently-infested material away from residual green trees will discourage further infestation from pine engravers (see Appendix A).
    - Chipping is not encouraged during the spring; lop-n-scatter treatments are the preferred option.

Forest Health Protection was happy to assist the Tribal resource group, and can provide more information upon request. There are funding opportunities through Forest Health Protection for long-term bark beetle prevention strategies (Western Bark Beetle Initiative) every fiscal year. If there are any questions concerning this report or about funding opportunities, please do not hesitate to contact us.

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Appendix A. Recommendations for Proper Slash Treatment (Prevention of Pine Engravers, *Ips* species)

Below are recommendations to reduce the risk of insect infestation into standing green trees. These recommendations were developed to reduce the likelihood of subsequent attack, and reduce loss beyond acceptable levels. Treatments can be modified to accommodate Basic prevention methods for treatment of slash.

- If possible, schedule treatments AFTER July. *Ips* species are early fliers, emerging in early spring if temperatures are warm enough and quickly infest green slash. Be wary if there has been lots of activity (all bark beetles) in the area. High insect activity can either be an indication of high populations, but also that area is highly susceptible in its current state.

- Material that usually will **not** produce large insect broods: very large logs, lopped material less than 3 inches in diameter, old soured or partially dry slash.

- Any method that dessicate or dry out wood to make it unsuitable for brood survival. All stem pieces or large branches are recommended to be cut into 3 foot bolts or smaller. For larger pieces over 6 inches in diameter, additional scarring of the bark or putting singular pieces out in direct and full day sunlight will help with the drying process.

- Lopping and scatter is recommended over chipping in the spring, but make sure all pieces are cut to the smallest lengths if possible to accelerate drying. This technique may be a risk for subsequent attack, but if treated properly, losses should be low.

- Try and stack piles in full sunlight without shade. For large pieces, put these on the outside of piles rather than inside. If making piles, try and keep them small to accelerate drying. Cover tightly small piles with clear plastic to accelerate drying process.

- Larger piles: select locations where the pile can receive full sunlight and is set apart from residual trees. You can place piles amongst non-host species as a buffer. Burning pile in the fall would further reduce risk of further infestation or emergence in the spring. Best to completely remove slash from site.

- Slash should also not be created for more than one year in the same location. Make sure efforts are completed during the same year rather than returning the following year to continue. This will increase risk of second year beetles building in the area and overcoming green tree defenses